# POSITION-IDENTIFYING DEVICE

## BACKGROUND OF THE INVENTION

1. Field of the Invention

The invention relates to position-identifying devices for use with displays for identifying locations on the display and more particularly to a position identifying device which utilizes a narrow RF field in proximity to the area on the display to be identified and which is detected by selected sense amplifiers to thereby identify the position of the RF field and thus the desired area on the display.

2. Description of the Prior Art

Electronically generated cathode ray tube and optical projection images have been finding increased usage as input devices for data processing systems. These are particularly useful since they increase man/machine communications ability. The graphic nature of the input devices reduces substantially the training requirements for the operator since the graphic display may contain instructional material.

The operator in systems of this type is presented a graphic image under control of the data processor and a response is generated when he identifies one or more specific areas on the image.

In the case of cathode-ray tube displays, a light sensitive device is enabled at the operator selected response point and the beam as it paints the image at that point is detected. The deflection circuits at that time contain positional data defining the beam location. This information is sent to the data processor which can tell what the response was since it is aware of the image content and the position of the light-sensitive device. The above technique has been used extensively since it is effective in most instances and is troublesome only in those instances where a dark screen area requires identification.

With a projected image, however, positional information is not available. Prior art techniques for identifying response locations involves generating nonvisible (i.e., red) light-scanning columns and detecting these with sensors. These systems require the generation of clock signals and counters for providing positional information. Thus, the counters are gated when the sensor detects the scanning columns and the counter value indicates the one or the other coordinate values of the sensor.

Systems employing invisible scanning light columns and sensors are entirely satisfactory in operation, however, they are costly to manufacture and require precise alignment once disturbed or otherwise subjected to mechanical shock or vibration.

## SUMMARY OF THE INVENTION

The invention contemplates a device for providing positional information relative to an electromagnetic radiating probe when positioned in close proximity to selected locations on a surface and comprises, a first group of spaced substantially parallel elongated conductive loops, a second group of loops as set forth above arranged to intersect the first group of loops, said loops intersections defining a plurality of response areas on the said surface, a first group of sense amplifiers each responsive to one of the first group of loops for providing an output when the probe is bracketed by the connected loop, and a second group of sense amplifiers each responsive to one of the second group of loops for providing an output when the probe is bracketed by the connected loop whereby the probe position can be determined by the sense amplifier outputs when it is located within any of the response areas.

One object of this invention is to provide an electromagnetic detection system for deriving the positional data defining the physical locations of a probe which radiates electromagnetic energy detected by the system.

Another object of the invention is to provide a position-detecting system which is capable of operating under all ambient lighting conditions.



A further object of the invention is to provide a position-detecting system as set forth above which is suitable for use with a variety of different display devices.

Yet another object is to provide a position detection system as set forth above which is inexpensive to manufacture, reliable in operation and insensitive to mechanical shock or vibration.

A further object of the invention is to provide an electromagnetic detection system as set forth above which is capable of discriminating between a supervisory probe and an operator probe to provide unlimited response to the supervisory probe and limited response to the operator probe.

The foregoing and other objects, features and advantages of the invention will be apparent from the following more particular description of a preferred embodiment of the invention, as illustrated in the accompanying drawings.

## BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a block diagram of a novel position detection and signalling system constructed in accordance with the invention;

FIG. 2 is a schematic diagram of a sense amplifier shown in block form in FIG. 1;

FIG. 3 is a schematic electromechanical drawing illustrating the construction of a radiating probe; and

FIG. 4 is a block diagram illustrating how the circuit shown in FIG. 1 can be utilized for detecting unlimited supervisory probe responses and limited operator probe responses.

## DESCRIPTION OF THE PREFERRED EMBODIMENT

In FIG. 1, element SC represents schematically a ground glass viewing screen, the face of a cathode-ray tube or any other screen or device for displaying graphic information, a plurality of spaced elongated substantially parallel vertical conductive loops VL1—VL5 are supported within or in close proximity to the screen SC. A second group of similarly arranged horizontal loops HL1—HL8 are also supported in or in close proximity to the screen SC. The intersections of loops HL and VL are insulated from each other to provide physical isolation between loops HL and VL at the intersections.

Loop VL1 is connected to the inputs of a sense amplifier SAX1 which provides an output whenever a radiating probe is bracketed by the conductive loop. The field radiated by the probe induces currents in the loop which are sensed by amplifier SAX1. The field will only induce currents which can be sensed when its center is located within the loop and bracketed by the elongated conductive portion forming the loop. Loops VL2—VL5 are connected in a similar manner to sense amplifiers SAX2—SAX5, respectively. Horizontal loops HL1—HL8 are connected to sense amplifiers SAY1—SAY8 respectively. Sense amplifiers SAY1—SAY8 provide outputs Y1—Y8, respectively, while sense amplifiers SAX1—SAX5 provide outputs XI—X5, respectively.

Sense amplifiers SAY1—SAY8 provide information with respect to the location of the probe in the vertical direction along the Y-axis. Thus, if the probe is located at position P, amplifier SAY5 provides an output indicating that the vertical position of the probe is at coordinate Y5. Likewise, amplifiers SAX1—SAX5 provide information relative to a location of the probe along the X-axis. Thus, if the probe is located at the position P, amplifier SAX4 provides information indicating that the probe is at coordinate X4 along the X-axis. If the probe is located at the intersections of two loops, outputs are provided from both amplifiers SAX and SAY indicating the precise coordinates of the probe. However, if the probe is located at position A as indicated in the drawing, it is not bracketed by any of the loops thus no information is provided by any of the amplifiers. If the probe is located at position B as indicated in the drawings, amplifier SAX3 will provide information relative to the probe since the probe is located within loop VL3 and thus is bracketed by the conductor forming the loop. However, in this instance, no information is provided